REMARKS

The Office Action dated June 10, 2003 has been received and carefully noted. The above amendments and the following remarks are submitted as a full and complete response thereto.

Claims 13-17 have been added. Upon entry of the Response, claims 1-17 will be pending in the present application. Claims 1, 3, 5, 7, 9, and 13 are independent claims. No new matter has been added. Claim 1-17 are respectfully submitted for consideration.

Rejection of Claim 9 Under 35 U.S.C. §102(e):

Claim 9 of the present application has been rejected under 35 U.S.C. §102(e) as being anticipated by U.S. Patent No. 6,321,940 B1 to Imatomi et al. (Imatomi '940). This rejection is respectfully traversed.

Claim 9 recites a method for controlling an injection molding machine in order to control the movement of a molten resin in a heating cylinder of the injection molding machine. According to claim 9, the injection molding machine includes a screw arranged within the heating cylinder to be rotatable and to be linearly movable and having a flight of a pitch P. Also according to claim 9, the molten resin is moved in a forward feeding direction during a plasticization process and an injecting process. The method includes the step of linearly moving the screw backwards relative to the forward feeding direction of the molten resin and simultaneously rotating the screw in the forward feeding direction, after completion of the plasticization process or the injecting process.

Imatomi '940 discloses an "injection apparatus and method of controlling the same" (Title). Imatomi '940 also discloses that "[w]hen the screw 12 is rotated in a forward direction during a metering step, pellets of resin are supplied...and molten resin is caused to advance" (Column 6, lines 20-23). Imatomi '940 further discloses that "[a]s a result, the screw 12 retracts...and the molten resin is accumulated on the front side of the screw head" (Column 6, lines 24-26).

However, Imatomi '940 fails to disclose or suggest at least "linearly moving the screw backwards", as recited in claim 9 of the present application. Rather, in Imatomi '940, the retraction of the screw is due to the back pressure of the molten resin, which promotes a non-linear/variable motion of the screw. Further, according to Imatomi '940, the screw is not forcibly moved backwards, but instead naturally moves backwards.

Applicants respectfully submit that fact that the retraction speed of the Imatomi '940 screw never becomes linear/constant is apparent at least because Imatomi '940 fails to disclose or suggest a specific retraction speed for the screw. Applicants respectfully further submit that the lack of disclosure or suggestion of such a speed is explained by the fact that, in Imatomi '940, it is impossible to set the retraction speed of the screw or to keep the speed linear/constant.

In order to more clearly illustrate at least some of the distinctions between Imatomi '940 and the method recited in claim 9, Applicants point out that, according to certain embodiments of the method recited in claim 9, the linearity of motion is achieved by forcibly moving the screw backwards, for example, by driving a servomotor. That

such forcible moving of the screw is neither disclosed nor suggested in Imatomi '940 is a further testament to the fact that the Imatomi '940 apparatuses and methods do not contemplate and cannot achieve the linear motion recited in claim 9.

Although Imatomi '940 discloses a second retraction operation of the screw on column 12, lines 5-9, thereof, this second retraction operation is a suck-back operation, which is known in the art to be carried out without rotation of the screw. Accordingly, the retraction of the screw by the suck-back operation disclosed in Imatomi '940 is also quite different from the backward movement of the screw while "linearly moving the screw backwards" and "simultaneously rotating the screw", as recited in claim 9.

At least in view of the above, Applicants respectfully submit that claim 9 is patentable over Imatomi '940. Hence, reconsideration and withdrawal of the rejection of claim 9 under 35 U.S.C. §102(e) over Imatomi '940 is respectfully requested.

Rejection of Claims 1-12 Under 35 U.S.C. §103:

Claims 1-12 of the present application has been rejected under 35 U.S.C. §103(a) over U.S. Patent No. 4,879,077 to Shimizu et al. (Shimizu '077) in view of U.S. Patent No. 4,540,359 to Yamazaki (Yamazaki '359) because it is alleged that it would have been obvious to one skilled in the art of the present invention to combine Shimizu '077 and Yamazaki '359 to obtain the claimed invention. This rejection is respectfully traversed.

Claim 1 recites a method for controlling an injection molding machine including a heating cylinder and a screw disposed in the heating cylinder, and performing a

plasticization/measuring process and an injecting process. The method recited in claim 1 includes the step of defining a synchronization ratio S of a rotation speed of the screw to be 100 % when the position of a flight thereof does not apparently move relative to a backward speed V of the screw, and moving the screw backwards while rotating it after completion of the measuring process or the injecting process, wherein a rotation speed R of the screw during the backward movement is given by multiplying the rotation speed R, which is expressed by the equation, R = backward speed V/pitch P of the flight, by an arbitrary synchronization ratio Sx.

Claim 3 recites a method for controlling an injection molding machine including a heating cylinder, a screw disposed in the heating cylinder, a first driving source for driving the screw in an axial direction, a second driving source for rotating the screw, position detecting means for detecting an axial position of the screw, rotation-speed detecting means for detecting the rotation speed of the screw, and a controller for controlling the first driving source and the second driving source dependent on the detecting signals transmitted from the position detecting means and the rotation-speed detecting means, and performing a plasticization/measuring process and an injecting process. The method recited in claim 3 includes the step of defining a synchronization ratio S of a rotation speed of the screw to be 100 % when the position of a flight thereof does not apparently move relative to a backward speed V of the screw, wherein the controller moves the screw backwards while rotating it after the completion of the measuring process or the injecting process, and wherein a rotation speed R of the screw

during the backward movement is given by multiplying the rotation speed R, which is expressed by the equation, R = backward speed V/pitch P of the flight, by an arbitrary synchronization ratio Sx.

Claim 5 recites a method for controlling an injection molding machine in order to perform a resin plasticization/measuring process and an injecting process, wherein the injection molding machine includes a heating cylinder and a screw having a flight of a pitch P, the screw being arranged within the heating cylinder. The method recited in claim 5 includes the step of defining a synchronization ratio S with reference to a rotation speed R and a linear backward speed V of the screw, the synchronization ratio S being equal to 100% when the flight does not apparently move while the screw is rotated and linearly moved backwards, the synchronization ratio S being smaller than 100% when the flight moves backwards while the screw is rotated and linearly moved backwards, the synchronization ratio S being greater than 100% when the flight moves forwards while the screw is rotated and linearly moved backwards. The method further includes the step of making the screw linearly move backward at a selected synchronization ratio Sx and simultaneously rotate after completion of the plasticization/measuring process or the injecting process. According to the method, a selected rotation speed Rs of the screw being given by: $Rs = (V/P) \times Sx$.

Claim 7 recites a method for controlling an injection molding machine in order to perform a resin plasticization/measuring process and an injecting process, wherein the injection molding machine includes a heating cylinder, a screw having a flight of a pitch

P and arranged within the heating cylinder, a first driving source for driving the screw in an axial direction, a second driving source for rotating the screw, a position detecting device for detecting an axial position of the screw, a rotation-speed detecting device for detecting the rotation speed of the screw, and a controller for controlling the first and the second driving sources in response to detecting signals transmitted from the position detecting device and the rotation-speed detecting device. The method includes the step of defining a synchronization ratio S with reference to a rotation speed R of the screw and a linear backward speed V of the screw, the synchronization ratio S being equal to 100% when the flight does not apparently move while the screw is rotated and linearly moved backwards, the synchronization ratio S being smaller than 100% when the flight moves backwards while the screw is rotated and linearly moved backwards, the synchronization ratio S being greater than 100% when the flight moves forwards while the screw is rotated and linearly moved backwards. The method also includes the step of controlling the movement so that the screw is linearly moved backward at a selected synchronization ratio Sx and simultaneously controlling the rotation of the screw, after completion of the plasticization/measuring process or the injecting process. According to the method, a selected rotation speed Rs of the screw is given by: $Rs = (V/P) \times Sx$.

As discussed above, according to claims 1, 3, 5, and 7, the screw is moved backwards and is simultaneously rotated after completion of the measuring process or the injection process. According to these claims, the rotation speed of the screw during the backward movement is given by multiplying the rotation speed (R), which is expressed

by the equation, R = backward speed (V) / pitch (P) of the flight, by the arbitrary or selected synchronization ratio (Sx). According to certain embodiments of the methods recited in claims 1, 3, 5, and 7, the screw is forcibly moved backwards, and the backward movement of the screw is carried out with rotation of the screw. According to each of these claims, the rotation speed R is defined by the backward speed V of the screw.

According to claim 9, the screw is moved linearly backwards relative to the forward feeding direction of the molten resin and simultaneously rotated in the forward feeding direction, after completion of the plasticization process or the injecting process. According to certain embodiments of the method recited in claim 9, the screw is forcibly moved backwards and the screw is rotated in the forward feeding direction.

Shimizu '077 discloses a "control method of an injection molding machine, and more particularly to a control method of controlling a screw in an injection process" (column 1, lines 7-10). Shimizu '077 also discloses that "since the screw 2 is rotated in the reverse direction to the rotational direction in the measuring process at the same time when the screw 2 is moved forward in the injection process, the apparent position of the ridge 2h or groove 2d of the screw 2 in a predetermined position of the heating cylinder becomes substantially stationary" (column 2, lines 58-64). Shimizu '077 further discloses that "slight backward movement from this position can be allowed" (column 2, lines 64-65). In addition, Shimizu '077 discloses a "predetermined speed r (rotation/second) [that] can be set by, for example, r =Vs/L, where Vs is a forward moving speed of the screw" (column 2, lines 49-51).

However, Shimizu '077 fails to disclose or suggest at least that the screw is moved backwards more than the "slight" amount discussed above. Also, Shimizu '077 fails to disclose or suggest at least a rotation speed R of the screw during the backward movement that is given by multiplying the rotation speed R, which is expressed by the equation, R = backward speed (V) / pitch (P) of the flight, by an arbitrary synchronization ratio (Sx), as recited in claims 1, 3, 5, and 7 of the present application.

Yamazaki '359 discloses "[a]n injection molding machine wherein both a clamping mechanism and an injection mechanism are actuated by means of a servo motor" (Abstract, lines 1-3). Yamazaki '359 also discloses a "resin [that] is molten and plasticized by the injection heating cylinder 21 and [that is] stayed in the extreme end of the injection screw 20 (column 6, lines 29-31). Yamazaki '359 further discloses that "[a]s the molten resin increases, the injection screw 20 is withdrawn by resin pressure while being rotated" (column 6, lines 31-33). In addition, the withdrawal of the screw disclosed in Yamazaki '359 is due to the back pressure of the molten resin, as discussed above in connection with Imatomi '940.

Yamazaki '359 fails to disclose or suggest at least "linearly moving the screw backwards", as recited in claim 9 of the present application.

As shown above, the Yamazaki '359 injection machine withdraws the screw included therein. In other words, the Yamazaki '359 screw moves backwards. In direct contrast, as also discussed above, the Shimizu '077 injection molding machine screw is not disclosed as being able to move backwards more than a "slight" amount. Rather, a

relatively large backward movement of the screw, such as the withdrawal disclosed in Yamazaki '359, is contrary to the objectives of Shimizu '077. Hence, at least for this reason, Applicants respectfully submit that one skilled in the art would not combine the disclosures of Shimizu '077 and Yamazaki '359, and that the rejection of claims 1-12 under 35 U.S.C. §103(a) over Shimizu '077 in view of Yamazaki '359 is therefore improper.

At least in view of the above, reconsideration and withdrawal of the rejection of claims 1-12 under 35 U.S.C. §103(a) over Shimizu '077 in view of Yamazaki '359 is respectfully requested. It is respectfully requested that all of claims 1-17 be found allowable, and this application passed to issue.

If for any reason the Examiner determines that the application is not now in condition for allowance, it is respectfully requested that the Examiner contact, by telephone, the applicant's undersigned representative at the indicated telephone number to arrange for an interview to expedite the disposition of this application.

In the event this paper is not being timely filed, the applicant respectfully petitions for an appropriate extension of time. Any fees for such an extension together with any additional fees may be charged to Counsel's Deposit Account 50-2222.

Respectfully submitted,

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